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RELATIONSHIPS OF INTELLIGENCE TEST SCORES TO MEASURES OF ANXIETY, IMPULSIVENESS AND VERBAL INTERESTS IN GIFTED ADOLESCENTS. FINAL REPORT.

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The degree to which potentially useful group intelligence tests were affected by personality characteristics such as anxiety, impulsiveness or caution, and verbal interests was investigated by a battery of intelligence, interest, and personality tests administered to 1,163 gifted adolescents in special summer programs. Intelligence was measured by the D-48 (non-verbal) and the Terman Concept Mastery Test (CMT-Verbal), anxiety by the Minnesota Multiphasic Personality Inventory (MMPI) A-scale, impulsivity by the MMPI Pd- and Ma-scales, verbal interest by the Strong Vocational Interest Blank (SVIB) Lawyer and Author-Journalist (Men's) scales, self-concept by Gough's Adjective Check List, and carelessness by errors on "easy" intelligence items. Significant negative correlations were found between anxiety and intelligence, impulsivity and intelligence, and carelessness and intelligence. Positive correlations were found between verbal interest and verbal intelligence, non-verbal and verbal intelligence, and counseling readiness and intelligence. Wider use and revision of the D-48, restricted use of the CMT, part and total score-reporting of the CMT, and additional correlational analyses between and MMPI scales and Adjective Check List, and between the SVIB scales and the two intelligence tests are recommended. (WR)

Final Report

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Relationships of Intelligence Test Scores to Measures of Anxiety, Impulsiveness and Verbal Interests in Gifted Adolescents

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Summary

Two group intelligence tests were given to gifted adolescents in a special residential summer program, the Governor's School of North Carolina. One test, the D 48, is non-verbal and timed while the other, the Terman Concept Mastery Test (CMT), is essentially verbal and is untimed. Both tests seemed suitable for these subjects (N = 770 for the D-48, N = 1163 for the CMT) and gave a wide range of scores. Several items on the D-48 were found to be badly misplaced in order of difficulty, confirming the same observation in other studies. Although many items on the CMT were also found to be out of difficulty order, this is less crucial for an untimed test.

An operationally defined index of test carelessness was derived for both tests by counting errors made on the first or "easy" half of the items for each subject when ranked in order of difficulty. Subjects defined as careless on one test were not necessarily careless on the other test, although there was an extremely limited range of carelessness scores on the D-48 that may have attenuated relationships.

The careless subject on the D-48 tended to get more items wrong and to omit fewer items but did not get any fewer right than the careful subject. On the CMT the careless subject got more right as well as more wrong, and omitted fewer items.

Subjects who obtained high test scores on the D-48 tended to get fewer items wrong, to make fewer careless errors, and to omit fewer items. On the CMT, however, the high scoring subject did not show such a strong tendency to get fewer wrong but did make even fewer careless errors.

The CMT comprises two parts, Vocabulary and Analogies; they proved to be highly correlated at about the same level reported in the test manual. The pattern of intratest correlations as well as the intertest correlations with the D-48 showed that Analogies may be more similar to the D-48 in terms of intellectual functions than is Vocabulary.

Anxiety as measured by the A scale of the Minnesota Multiphasic Personality Inventory (MMPI) was negatively related to intellectual performance as predicted. This trend was somewhat stronger for the D-48. No evidence of curvelinear relationship between A and the test scores was found.

One scale on Gough's Adjective Check List (ACL) also included as a measure of anxiety, Counseling Readiness (Crs), showed a positive relationship contrary to prediction. This was somewhat more marked for the CMT. An ACL scale included as the obverse of anxiety, Self-Confidence (S-Cfd), was essentially unrelated to the test scores.

Impulsiveness as measured by the Psychopathic Deviate (Pd) and Hypomania (Ma) scales of the MMPI was negatively related to test scores as predicted and positively correlated with careless errors particularly on the CMT. The ACL scales for Lability (Lab) and Need Change (Cha) also included as impulsivity measures showed no systematic relationship with test scores.

Caution as measured by ACL scales for Self-Control (S-Cn), Need Order (Ord), and Need Abasement (Aba) were unrelated to the intelligence tests.

Three Strong Vocational Interest Blank (SVIB) scales were included as measures of verbal interest: Advertising Man (Adv), Lawyer (Law), and Author-Journalist (A-J). As predicted, they were uncorrelated with the non-verbal D-48, but two of the scales, Law and A-J, were highly positively related to the CMT, thus partially confirming this aspect of the prediction.

Introduction

Problem. Because man's behavior is inherently complex and complicated, it is inevitable that it be studied in bits and pieces rather than as a whole. Some of the bits and pieces have been studied more intensively than others because certain aspects of behavior are more readily observable than others or because they have more direct bearing on the practical problems of life. Intelligence is one aspect of behavior that has been investigated for both of these reasons. It is relatively easy even in superficial observation to distinguish a grossly defective child from a normal child and to distinguish a clearly superior child from both. A half century or so of intensive work has produced many psychometric instruments capable of yielding scores affording a practical method of assigning persons to positions on a continuum of intelligence. At the same time the assignment to levels of intelligence has obvious practical implications in terms of school progress, job capabilities, or even in the ordinary business of getting along in the world.

The utility of intelligence tests and their theoretical relationship to the concept of intelligence has had important implications that are well summarized in the editor's introduction to a book of readings, Intelligence and ability:

> We began to know (or to feel that we knew) much more about the cognitive aspects of the mind than about the affective or conative. This tripartite division, so useful as a means of structuring the complexities of the relatively new subject of psychology, came to be a handicap as well as a help, since it encouraged the erection of walls and the creation of water-tight compartments. It is clear now, that it is not only unrealistic but misleading to think of man's intellectual gifts and capabilities purely in cognitive terms. (Wiseman, 1967, p. 7)

It is ironic that Wiseman's complaints should be underscored and exemplified by the recent appearance of a major book entitled The nature of human intelligence (Guilford, 1967) in which the term personality does not even appear in the index. That the affective and conative are ignored is shown by the chapter titles appearing in a section of this book entitled Implications for psychological theory: Perception and cognition, Learning, Retention and recall, and Problem solving and creative production. This author thus seems to be perpetuating the traditional division of psychological tests and measurement into the separate rubrics of intelligence, personality, interest, and special aptitudes.

Fortunately there have been at the same time some researchers who have been relating personality characteristics--including cognitive functions--to many aspects of human behavior. The extensive factor analytic work of R. B. Cattell (1965), for example, has resulted in the identification of the second most salient personality dimension as "more intelligent" vs. "less intelligent" or "high 'g'" vs. "low 'g'." The intimate relationship between personality in general and the aspect of behavior usually called intelligence led H. G. Gough (1953) to refer to a scale on his

personality inventory as "a nonintellectual intelligence test."

Despite this trend, it is still customary to rely almost exclusively on intelligence tests to make judgments as to the basic intelligence of students even while acknowledging that such scores may reflect many other variables in addition to intelligence per se. It is admitted that temporary mood states or illness may lower scores and that favorable settings and motivation may increase performance. Background experiences, particularly those related to socio-economic status and educational level, are obviously related to test performance. But relatively little work has been done to demonstrate the importance of personality characteristics in modifying the nature of intellectual behavior.

Increased knowledge of the relationships between nonintellective factors and performance on tests of intelligence is important for theoretical and for practical reasons. Further advances in conceptualization of intelligence may come from a greater understanding of the sources of variance contributing to test scores, and, psychometrically, it may be possible to design better tests of basic intelligence which allow for the influence of these sources of variance.

Three areas that seem particularly likely to show systematic relationships to scores on tests of intelligence are: (1) anxiety, (2) impulsiveness, and (3) verbal interests.

Related Literature. A major contribution to the study of anxiety has been made by Sarason and his associates (Sarason, et al, 1960). They found consistent negative correlations between scores on standard intelligence tests and measures of anxiety. On the other hand, when a test task involved caution so that carefulness and methodicality were rewarded, the usual relationship was reversed. That is, the IQ level was unrelated to test scores, but the high anxiety children earned high "caution" scores.

At the college level, it has been shown (Sherriffs and Boomer, 1954) that the anxious student is handicapped by a Rights-minus-Wrongs scoring formula to the extent of one letter grade. This was true even when knowledge of course content was held constant; they were penalized by a tendency to omit more items in general, and to omit items even though it could be shown that they actually knew the answer.

In personality testing a clear tendency for a negative relationship between admission of anxiety symptoms and performance has been demonstrated (Gough, 1953). Other studies support these findings.

A study recently completed by the present writer (Welsh, 1967) indicates that students with higher verbal interests perform relatively better on verbal intelligence tests than on non-verbal tests.

The evidence suggests, then, that anxiety, impulsiveness (or caution), and verbal interests may be systematically related to intelligence test performance.

Objectives. For use in follow-up studies of his gifted children Terman developed a difficult group intelligence test (Terman, 1956). Because of its high ceiling it has been useful in studies of creative adults (MacKinnon, et al, 1961) and it has been used in special programs for gifted high school students in North Carolina and in Georgia. Instructions for this test, the Terman Concept Mastery Test (CMT), state: "Omit those items that you could answer only by pure guess, but answer all you think you know, even if you are not quite certain. Do not study long over any pair." It is possible that the personality characteristics found by Sherriffs and Boomer may be applicable here and there may be differences in the tendencies of subjects to guess or to omit items because they are not sure of the answer or, indeed, not sure of themselves. Since the scoring procedures for the CMT involve a Rights-minus-Wrongs formula, it is crucial to determine what relationships may be contributing to the test scores.

The question to be asked is whether anxious subjects show a different pattern of responses from the non-anxious, specifically whether anxious subjects earn lower scores on the number correct and whether they are less inclined to guess, that is, they also show fewer incorrect responses. A related question is whether impulsive subjects are more inclined to guess and show more incorrect answers, and also whether they tend to make more errors on easy items than more cautious subjects.

Another question to be asked is the extent and nature of the relationship between verbal interests and scores on the CMT since this test comprises for the most part vocabulary and other verbal material. A non-verbal test, the D-48 (Black, 1963), given to part of the subjects will help clarify the nature of this relationship.

Thus, the basic objective of this study is to determine the degree to which a potentially useful group intelligence test will be affected by personality characteristics such as anxiety, impulsiveness or caution, and verbal interests.

Procedure

General Design. Since the data for the study comprised test scores for a large number of subjects on several different variables, intercorrelation of sets of scores seemed most appropriate and Pearson product-moment coefficients of correlation were computed.

However, there is the possibility that some of the relationships, particularly with anxiety measures, may be non-linear (see, for example, Spielberger and Katzenmeyer, 1959); so scatterplots were constructed and examined for non-linearity.

Item analyses of the intellectual measures were carried out to determine the order of difficulty of the individual items.

Population. Subjects from whom the data employed in this study had been obtained are gifted and talented high school students who attended a

special residential summer program, The Governor's School of North Carolina, (Carnegie Corporation Quarterly, 1964) in 1963, 1964, and 1965. A total of 1163 subjects were tested during those summers.

Instrumentation. An extensive battery of tests was administered to the students. The tests further analyzed in this study are (1) a non-verbal intelligence test given during the second and third summers, the D-48 (Welsh, 1966); (2) the Terman CMT; (3) a personality test, the Minnesota Multiphasic Personality Inventory; (4) a measure of self-concept, Gough's Adjective Check List; and (5) an interest test, the Strong Vocational Interest Blank (the men's form was given to the girls as well as the boys).

(1) The D-48 Test

The D-48 is an American adaption of a non-verbal test developed in its present form by the staff of the Centre de Psychologie Appliquee in France. The items are in the form of sets of dominoes in which the subject must discern the relationship in each series and fill in the appropriate numbers in the last domino, which is blank. No verbal ability, except for reading the instructions, is required for this test and the Preliminary Manual (Black, 1963) describes it as "essentially a non-verbal analogies test measuring primarily the 'g' or general factor in intelligence" (p. 1).

The D-48 actually comprises only 44 test items since four items are used as examples to give the subject practice before embarking on the test proper, which is timed. Twenty-five minutes are allotted to the test and subjects are informed at the end of 15 minutes that 10 minutes remain. The time limit seems appropriate since almost 20 per cent of the subjects completed all of the items, but the range of difficulty proved adequate and none of the subjects got all of the items correct although two subjects missed only one item. The lowest score was only two items correct; thus there was a wide score range of 40 points.

It should be noted that the score consists of the total number of items correct; there is no "correction for guessing" since the chances of guessing an item correctly are only one in 49 for both halves of a domino (1/7 times 1/7). On the other hand, it is apparent that the subject who got only two items correct must have been doing a great deal of guessing, since he actually answered all 44 of the items.

The mean score for 770 Governor's School subjects is 29.55 with a standard deviation of 6.07. These subjects average much higher than the 15, 16, and 17 year old French school children reported in the Manual, as would be expected. They score almost as high as the U. S. college males and females reported there and at about the same level as 20-24 year old French students.

Cantwell (1966) found a mean of 26.67, S. D. 6.13, for 139 female college subjects and Domino reported 28.06 and 5.44 for 94 college males. Lebanese college grade males tested by Rafi (1967) fell somewhat lower

with a mean of 26.04, S. D. 5.80, for 1167 subjects while a second group of 170 showed 25.73 and 5.97. The present writer has used the D-48 in a Tests and Measurements course given to advanced undergraduates and graduates; a mean of 29.67, S. D. 4.87, has been obtained for 85 subjects with no apparent difference between undergraduates and graduates.

The Governor's School subjects, then, seem to fall at about college level in terms of mean score but are somewhat more variable possibly because of a few extremely low scores. The skewness of the distribution is apparent in Table 1 where the lowest 10 per cent of the subjects ranged from 20 down to two. Summary statistics and cumulative percentages are also given in the table. No significant sex differences were found in the distribution of scores.

(2) Terman Concept Mastery Test

The CMT is an untimed test of 190 items in two parts, Part I contains 115 word pairs that must be classified as either synonyms or antonyms, Part II contains 75 analogies. The original form of the CMT (Form A) was devised in 1939 for follow-up studies of the Stanford research with gifted subjects and is described in detail by Terman and Oden (1947, pp. 125-146). A revised form (previously Form B but now called Form T) was prepared in 1950 by eliminating some of the excess top items and extending the level downwards so that spouses of the gifted subjects might be included in the range of scores (Terman and Oden, 1959, pp. 52-63).

Form T has now been published and a Manual (Terman, 1956) describes the test, gives directions for administration and scoring, and summarizes some research findings. The test is, according to the Manual, "a measure of the ability to deal with abstract ideas at a high level. It is suitable for administration to college juniors and seniors and to graduate students." Since the present subjects were especially selected high school students of unusual abilities, the CMT seemed an appropriate measure of general intellectual ability with an adequate range of possible scores.

The CMT Manual suggests that, "those for whom the test is intended will ordinarily complete it within forty minutes." Most of the students did complete the test within that time, although a few took a full hour. None of the subjects experienced any difficulty in following the directions given in the test booklet but some questions were raised about guessing. The instructions state, "Omit those items that you could answer only by pure guess, but answer all you think you know, even if you are not certain." Apparently some of the students did too much guessing since 16 of them received scores below zero. Negative scores are possible because wrong answers are penalized: on Part I, Vocabulary, a right-minus-wrong (R-W) formula is used, and on Part II, Analogies, the score is the number right minus one half the number of wrong answers ($R-\frac{1}{2}W$); for an odd number of wrongs the .5 is dropped. The total score is the sume of the two part scores; with all items correct this would be 190 (115+75).

Table 1

Distribution of D-48 scores: number of items correct

Scores	Frequency	Cumulative Percentage
43-44	2	100.0
41-42	9	99.8
39-40	20	98.6
37-38	57	96.0
35-36	77	88.6
33-34	95	78.6
31-32	105	66.2
29-30	105	52.6
27-28	83	39.0
25-26	65	28.2
23-24	64	19.7
21-22	30	11.4
19-20	27	7.5
17-18	10	4.0
15-16	8	2.7
13-14	5	1.7
11-12	3	1.0
9-10	1	.65
7-8	2	.49
5-6	0	
3-4	1	.26
1-2	1	.13

N = 770

M = 29.55

SD = 6.07

Table 2 shows the distribution of scores with cumulative percentages and summary statistics for all of the 1163 subjects. The highest score was 161 and the lowest -32, giving a range of 193 score points. The mean score falls below all of the ten groups listed in the Manual although it is equivalent to the lowest group reported, 344 Air Force captains, with a mean of 60.1 and a standard deviation of 31.7. The highest group is, of course, the 1004 subjects of the Stanford gifted study who obtained a mean of 136.7 and standard deviation 28.5. None of the gifted subjects scored below 40 and half of them fell above 141. The spouses of the gifted subjects (N = 690) are midway between the extremes of the groups with a mean of 95.3 but were more variable and had a standard deviation of 42.7. It is of interest that four of the spouses obtained negative scores.

The Manual for the Miller Analogies Test (Miller, 1960) reports correlations of .73 for two groups of subjects with CMT scores. The means and standard deviations on the CMT are given as follows: for 77 graduate students in psychology in a western university, 107.7 and 26.2; for 207 graduate students in various departments in a southern university, 53.1 and 32.4. The present subjects, if compared to subjects from the same geographical region, scored somewhat higher than graduate students. On the other hand, more recently the present writer has administered the two tests to sections of a tests and measurements course for advanced undergraduate and graduate students. For N = 85 the following statistics were found:

	M	SD	
CMT	81.96	24.41	r = .24
D-48	29.67	4.87	

The Governor's School subjects fell somewhat below these subjects on the CMT although they scored as high on the D-48.

Terman and Oden (1959) found consistent sex differences in favor of males both for the gifted subjects and their spouses. The respective means are: 139.4 to 133.4 and 102.6 to 90.5. Although these differences are not marked, statistical significance is shown by critical ratios of 3.4 and 3.6. The present subjects show a similar trend with males exceeding females in mean scores: 61.1 to 53.9; the difference gives a critical ratio of 4.25 which passes the .001 level of significance. The difference in means is of little practical significance, however, because the distributions for both sexes have such a wide range and show almost complete overlap in range.

For the two intelligence tests seven different measures are of interest:

a. the number of items right--R.
b. the number of items wrong--W
c. the number of items omitted--O
d. the number of careless errors--C. In this study the order of difficulty of the items in both tests was determined by the

Table 2

Distribution of CMT scores: rights minus wrongs

Scores	Frequency	Cumulative Percentage
160-169	1	100.0
150-159	1	99.91
140-149	7	99.83
130-139	12	99.24
120-129	12	98.2
110-119	21	97.2
100-109	34	95.4
90-99	58	92.4
80-89	86	87.4
70-79	126	80.0
60-69	163	69.2
50-59	169	55.2
40-49	150	40.7
30-39	133	27.8
20-29	85	16.3
10-19	62	9.0
0-9	27	3.7
- 1--10	13	1.4
-11--20	0	
-21--30	2	.26
-31--40	1	.09

N = 1163

M = 56.77

SD = 28.70

total number of subjects getting each item correct. With the items arranged in order of difficulty, an index of carelessness was defined for each subject as an error in the first or "easy" half of his own distribution of correct items. For example, suppose a subject attempted 25 items and got 20 of them correct. Any incorrect responses on items one through ten would be counted as a careless error, but any errors from item 11 on would be ordinary errors.

e. the "corrected" value of rights minus wrongs--R-W.
f. the number of items attempted, rights plus wrongs--R+W.
g. the ratio of e. and f.--R-W/R+W. This value was included to identify subjects who got proportionately more items correct regardless of the absolute number of items correct.

For consistency in terminology the term "measures" will be understood in this report to refer to these seven terms. The term "score" in the case of the D-48 will be "R" but for the CMT will be "R-W." It may also be noted that for the second part of the CMT, Analogies, the R-W formula actually means rights minus one-half wrongs; thus R+W is not exactly equivalent to the number attempted.

(3) The Minnesota Multiphasic Personality Inventory (MMPI)

The MMPI is an assessment device originally developed for use in medical settings but now widely used for general personality research. In its standard form the inventory comprises 550 statements which the subject marks as either "True or mostly true, as applied to you," or "False or mostly false, as applied to you." Although more than 200 special scales and scoring indeces have been developed (Dahlstrom and Welsh, 1960) there are in the standard profile only three "validity" scales and ten "clinical" scales (Hathaway and McKinley, 1967). Two of these regular scales, Pd and Ma, afford measures of impulsivity and a special scale, A (Welsh, 1956, 1965), is used to assess anxiety.

(4) The Adjective Check List (ACL)

The ACL is an assessment device developed by Professor H. G. Gough of the University of California at Berkeley that has proved useful in inferring the self-concept of a subject by the self-description he provices. The ACL comprises 300 adjectives arranged alphabetically from "absent-minded" through "zany" in a two-page booklet with the following instructions on the face sheet:

> DIRECTIONS: This booklet contains a list of adjectives. Please read them quickly and put an X in the box beside each one you would consider to be self-descriptive. Do not worry about duplications, contradictions, and so forth. Work quickly and do not spend too much time on any one adjective. Try to be frank, and check those adjectives which describe you as you really are, not as you would like to be.

The test Manual (Gough and Heilbrun, 1965) discusses 24 experimental scales and indeces that have been developed for use with the ACL. Although all of these measures have interesting possibilities in the study of personality and intelligence, seven scales were selected for use in the present study because they seemed particularly pertinent for the dimensions of concern. Impulsivity seems to be related to the scales for Lability and Need Change; caution to Self-Control, Need Order, Need Abasement; anxiety to Self-Confidence, Counseling Readiness.

(5) Strong Vocational Interest Blank (SVIB)

Subjects in the study, both boys and girls, were given the Men's Form of the SVIB (Strong, 1959), a well-known and widely used device to assess vocational interests. The SVIB comprises 400 items and is ordinarily scored for 50 or more scales but only three were utilized in the present study. Verbal interest was measured by scales for Advertising Man, Lawyer, and Author-Journalist; these are the Group X scales referred to by Darley and Hagenah (1955) as "verbal-linguistic." There is some evidence (Welsh, 1967) that among the present subjects those who are high in verbal interests tend to score higher on verbal than on non-verbal intelligence tests.

Results

Intelligence Measures. The difficulty level of the D-48 items was determined by tallying the frequency of correct response for each item; the frequency of incorrect response and of no response was also recorded. These data are given in Table 3 as "R" (right), "W" (wrong), and "O" (omitted). The range of difficulty fell from item 1, which was answered correctly by 765 of the 770 subjects, to item 42, which was answered correctly by only 80 of the subjects.

The difficulty level has also been expressed as a proportion in Table 4 where the range is from .9935 for item 1 to .1039 for item 42. These data are given in the first column headed "T" to indicate that the proportions are for the total group of subjects. Since varying numbers of subjects omitted each item, the difficulty level is also expressed in another form by calculating a proportion based on subjects getting an item right out of the number of subjects attempting the item. These proportions are given in column "A." Difficulty level expressed in rank order is given in column "RT" for total proportions and in column "RA" for proportions correct of those attempting each item.

It is apparent that the sets of ranks are quite similar; indeed, the rank order correlation between RT and RA gives a rho of .9995. On the other hand, it should be noted that a few items show some displacement. For example, item 44, the last item in the test, is answered correctly by only .1234 of the subjects; but of the subjects who had time to attempt this item .3558 got it correct. Thus item 44 ranks 43rd in difficulty when expressed as a proportion of all subjects but drops to 38th when expressed as a proportion of those attempting the item.

Table 3

Difficulty level of D-48 items expressed as frequencies

Item	R*	W	O	Item	R	W	O
1.	765	4	1	23.	486	254	30
2.	764	6	0	24.	367	319	84
3.	745	19	6	25.	204	412	154
4.	755	14	1	26.	198	485	87
5.	713	52	5	27.	562	202	6
6.	747	23	0	28.	614	119	37
7.	668	95	7	29.	551	214	5
8.	688	74	8	30.	661	100	9
9.	661	92	17	31.	501	186	83
10.	729	39	2	32.	360	320	90
11.	720	45	5	33.	591	129	50
12.	734	32	4	34.	384	316	70
13.	741	26	3	35.	271	321	178
14.	747	23	0	36.	311	281	178
15.	704	63	3	37.	261	341	168
16.	730	36	4	38.	104	355	311
17.	563	171	36	39.	313	217	240
18.	596	148	26	40.	218	266	286
19.	725	41	4	41.	108	359	303
20.	697	65	8	42.	80	285	405
21.	675	91	4	43.	104	247	419
22.	540	200	30	44.	95	172	503

N = 770

* Number of subjects getting item right (R), wrong (W), or omitting (O) it.

Table 4

Difficulty level of D-48 items expressed as proportions

Item	T*	RT	A	RA	Item	T	RT	A	RA
1.	9935	1	9948	1	23.	6312	29	6568	29
2.	9922	2	9922	2	24.	4766	31	5350	32
3.	9675	6	9751	4	25.	2649	38	3312	39
4.	9805	3	9818	3	26.	2571	39	2899	41
5.	9260	13	9320	13	27.	7299	25	7356	25
6.	9701	4.5	9701	5.5	28.	7974	21	8377	21
7.	8675	18	8755	19	29.	7156	26	7203	28
8.	8935	16	9029	16	30.	8584	19.5	8686	20
9.	8584	19.5	8778	18	31.	6506	28	7293	27
10.	9468	10	9492	10	32.	4675	32	5294	33
11.	9351	12	9412	12	33.	7675	23	8208	22
12.	9532	8	9582	8	34.	4987	30	5486	31
13.	9623	7	9661	7	35.	3519	35	4578	35
14.	9701	4.5	9701	5.5	36.	4039	34	5253	34
15.	9143	14	9179	14	37.	3390	36	4336	37
16.	9481	9	9530	9	38.	1351	41.5	2266	43
17.	7312	24	7670	24	39.	4065	33	5906	30
18.	7740	22	8011	23	40.	2831	37	4504	36
19.	9416	11	9465	11	41.	1403	40	2313	42
20.	9052	15	9147	15	42.	1039	44	2192	44
21.	8766	17	8812	17	43.	1351	41.5	2963	40
22.	7013	27	7297	26	44.	1234	43	3558	38

N = 770

* T = proportion of total group getting item right, RT = rank of item in T column, A = proportion of those attempting item answering correctly, RA = rank of item in A column; decimal point properly preceding each proportion has been eliminated.

Item 42, on the other hand, ranks 44th in both columns. The implication of this discrepancy is that there may be some subjects who might have gained a point in total score had they had time to reach the last item, which seems to be easier than one placed earlier in the sequence of items.

Item 39 also seems somewhat easier when viewed this way since it drops in difficulty rank from 33rd to 30th. Three items, however, would be judged more difficult on this basis since their rank is higher in the TA column than in the RA column; item 29 drops from 26th to 28th, item 41 from 40th to 42nd, and item 26 from 39th to 41st. The only other item showing a rank discrepancy of as much as two is item 3, which shifts from 6th to 4th, thus making it seem slightly more difficult when viewed as a proportion of subjects attempting it.

The overall difficulty rank of the items in terms of proportion of total subjects is quite similar to that given in the Manual for grade school subjects reported by Gough and Domino (1962). The rho between the sets of ranks is .940. A comparable order is reported by Rafi (1967) between college students in Lebanon and the Gough and Domino ranking; he gives the rho as .948. Thus, with grade school, high school, and college subjects the order of difficulty seems much the same. Several items are badly misplaced in the series for all three groups of subjects. Items 17 and 18 are much more difficult than the items preceding and following them. A second cluster of difficult items may be found in items 24, 25, and 26.

Another way of looking at the problem is this: in an ideal timed test the items should be placed in an absolute order of difficulty from the easiest to the hardest. The rank order correlation between the sequential numbers of the items and their difficulty rank should be 1.00, but with the present subjects rho is only .891, reflecting the misplacement of several items as noted above.

The implications for a timed test must be stressed again--if a subject works on a more difficult item because of its earlier placement in the sequence of items and does not have a chance to solve an easier item placed later, he may well be penalized by a point or two through no fault of his own. In a test like the D-48 with such a small standard deviation, 6.07, a few points would mean a relatively large difference in his standing on the test. In an untimed test like the Terman CMT, of course, misplacement in terms of item difficulty would be of less importance from this point of view.

Table 5 shows the distribution of carelessness scores for the D-48. It is apparent that there is a very narrow range of scores since even the most careless subjects made only four errors of this type and there were only two such subjects. Indeed, 563 of the 770 subjects got zero scores; thus more than 70 per cent did not make any careless errors at all.

A comparison was made of the 47 most careless subjects who had made two or more errors with a matched sample of 47 subjects who had made no errors. The careful subjects were matched for total score, that is, the number of items correct on an individual basis rather than by group means. The matching was exact for 42 of the subjects while for four of

Table 5

Distribution of carelessness scores (C) on D-48

Carelessness score	Frequency	
4	2)	
	)	
3	7)	= 47
	)	
2	38)	
1	160	
0	563	

N = 770

M = .3442

SD = .4294

them it was within one point and within two points for one subject. The D-48 statistics are shown in Table 6.

The mean number of items correct is, of course, the same for the two samples, 24.09, a value somewhat lower than that obtained for the entire group of 770 subjects. The slight discrepancy in exact matching for the five subjects mentioned above results in a difference of one point in the second decimal place of the standard deviation.

Differences between the means of the samples for the other D-48 measures were evaluated by t-tests. The careless subjects got more items wrong (t 1.89--close to .05 level for two-tailed test) but omitted fewer items (t 2.81 is significant beyond .01 level). The converse of omissions--the number attempted--is seen in the R+W column and has an identical t of 2.81. The ratio of the number correct and the number attempted is shown in the R-W/R+W column; although the careless subjects got proportionally fewer items correct of attempted items, the means are not significantly different (t 1.48).

The same measures from the CMT scores of the two samples of subjects were also obtained and the statistics are displayed in Table 7. None of the means showed a significant t. Thus we have no evidence that subjects defined as careless on one test will show similar characteristics on another test of intelligence.

The difficulty level of the CMT items is shown in frequency form in Table 8 and in proportions in Table 9. Although some of the items seem to be displaced in order of difficulty, this does not have the same implications noted above in the case of the D-48 since the CMT is untimed. It should be noted in the tables that the great difference between item 115 and item 116 is that the latter item is the first in Part 2 of the CMT.

The distribution of carelessness scores for the CMT is given in Table 10. It is apparent that there is a much wider range of scores than for the D-48. On that test the highest carelessness score of 4 represents only 9 per cent of the total number of items (44), while for the CMT the highest carelessness score of 28 is almost 15 per cent of the 190 items on this test.

The same kind of analysis as that described above was made by comparing two samples falling at the extremes of the carelessness distribution. It proved, however, more difficult to match subjects for total score (in this case the R-W value since the CMT is "corrected") and the samples comprise only 32 subjects each despite the greater number of subjects who had taken the CMT. One of the pairs differed by four points, two by three, one by two, sixteen by one, and twelve had identical R-W scores.

The careful subjects had C scores ranging from 0 to 5 and the careless subjects fell from 13 to the most extreme score of 28.

The means and standard deviations for the CMT measures are presented in Table 11. All of the measures showed t's far beyond the .001 level of significance: R--11.68, W--10.35, O--11.90, R+W--11.83, and R-W/R+W--4.65.

Table 6

Comparison of careless and careful D-48 subjects on D-48 scores

	R*	W	O	C	R-W	R+W	$\frac{R-W}{R+W}$
Careless subjects, N = 47							
M	24.09	14.85	5.06	2.23	9.23	38.94	.252
SD	5.46	6.86	4.48	.53	11.56	4.48	.304
Careful subjects, N = 47							
M	24.09	12.15	7.77	0.00	11.94	36.23	.348
SD	5.47	6.86	4.74	.00	11.47	4.73	.320
diff. in M's	.00	2.71	2.71	2.23	2.71	2.71	.096
t	--	1.89	2.81	28.55	1.13	2.81	1.48

sig. level for 90 d.f.

.10 = 1.66
.05 = 1.99
.01 = 2.63

* R--right, W--wrong, O--omitted, C--carelessness score.

Table 7

Comparison of careless and careful D-48 subjects on CMT scores

	R*	W	O	C	R-W	R+W	$\frac{R-W}{R+W}$
Careless subjects, N = 47							
M	90.85	61.28	37.87	6.02	43.45	138.26	.350
SD	20.57	26.46	38.68	4.88	22.69	35.12	.198
Careful subjects, N = 47							
M	91.66	63.06	35.28	6.70	43.43	139.89	.320
SD	23.31	25.89	33.79	4.90	30.50	31.78	.223
diff. in M's	.81	1.78	2.59	.68	.02	1.63	.03
t	.18	.33	.34	.67	.00	.23	.69

sig. level for 90 d.f.

.10 = 1.66
.05 = 1.99
.01 = 2.63

* R--right, W--wrong, O--omitted, C--carelessness score.

Table 8

Difficulty level of CMT items expressed as frequencies

Item	R*	W	O	Item	R	W	O
1.	1151	11	1	45.	687	315	161
2.	1148	13	2	46.	370	668	125
3.	1111	45	7	47.	608	255	300
4.	1083	79	1	48.	395	404	364
5.	1105	53	5	49.	471	438	254
6.	1117	36	10	50.	559	209	395
7.	898	174	91	51.	407	281	475
8.	1053	84	26	52.	430	452	281
9.	1071	82	10	53.	459	272	432
10.	1061	74	28	54.	374	588	201
11.	1017	137	9	55.	597	289	277
12.	1091	55	17	56.	399	175	589
13.	613	263	287	57.	401	287	475
14.	987	69	107	58.	575	373	215
15.	889	179	95	59.	580	361	222
16.	803	212	148	60.	431	423	309
17.	968	151	44	61.	392	201	570
18.	709	203	251	62.	574	341	248
19.	600	227	336	63.	260	628	275
20.	760	346	57	64.	408	179	576
21.	816	245	102	65.	311	602	250
22.	657	221	285	66.	372	230	561
23.	827	182	154	67.	498	267	398
24.	708	205	250	68.	571	254	338
25.	727	290	146	69.	546	380	237
26.	588	183	392	70.	603	308	252
27.	853	224	86	71.	381	225	557
28.	607	210	346	72.	424	458	281
29.	713	253	197	73.	519	372	272
30.	847	206	110	74.	322	280	561
31.	678	242	243	75.	334	249	580
32.	554	240	369	76.	299	583	281
33.	665	217	281	77.	358	258	547
34.	576	293	294	78.	495	284	384
35.	739	253	171	79.	422	456	285
36.	746	227	190	80.	356	465	342
37.	922	150	91	81.	314	312	537
38.	1001	134	28	82.	347	203	613
39.	669	262	232	83.	356	419	388
40.	304	267	592	84.	266	511	386
41.	397	408	358	85.	288	377	498
42.	561	225	377	86.	365	335	463
43.	612	284	267	87.	377	308	478
44.	433	366	364	88.	372	505	286

Table 8--Continued

Item	R	W	O	Item	R	W	O
89.	360	257	546	136.	989	108	66
90.	356	501	306	137.	964	154	45
91.	290	310	563	138.	969	146	48
92.	342	252	569	139.	975	177	11
93.	296	502	365	140.	811	284	68
94.	267	232	664	141.	938	221	4
95.	342	321	500	142.	928	197	38
96.	265	223	675	143.	721	398	44
97.	294	259	610	144.	759	345	59
98.	368	173	622	145.	650	371	142
99.	399	427	337	146.	892	205	66
100.	383	284	496	147.	472	480	211
101.	291	599	273	148.	870	217	76
102.	271	281	611	149.	838	278	47
103.	252	328	583	150.	565	496	102
104.	205	475	483	151.	429	576	158
105.	305	280	578	152.	714	351	98
106.	311	149	703	153.	983	142	38
107.	262	662	239	154.	591	441	131
108.	322	230	611	155.	572	379	212
109.	316	301	546	156.	519	578	66
110.	240	354	569	157.	322	733	108
111.	261	266	636	158.	862	218	83
112.	313	247	603	159.	433	507	223
113.	202	495	466	160.	453	350	360
114.	150	784	229	161.	477	461	225
115.	360	272	531	162.	610	464	89
116.	1120	40	3	163.	700	227	236
117.	1090	72	1	164.	142	530	491
118.	1090	58	15	165.	590	495	78
119.	1098	44	21	166.	596	429	138
120.	1116	45	2	167.	577	491	95
121.	1144	19	0	168.	462	588	113
122.	1145	17	1	169.	389	235	539
123.	1128	33	2	170.	471	543	149
124.	1146	17	0	171.	873	241	49
125.	1004	145	14	172.	374	469	320
126.	1058	80	25	173.	144	865	154
127.	1153	10	0	174.	363	422	378
128.	1075	86	2	175.	720	415	28
129.	724	287	152	176.	246	605	312
130.	853	292	18	177.	297	650	216
131.	473	434	256	178.	514	356	293
132.	1074	83	6	179.	344	390	429
133.	853	306	4	180.	412	649	102
134.	995	160	8	181.	440	296	427
135.	768	353	42	182.	179	506	478

Table 8--Continued

Item	R	W	O
183.	238	515	410
184.	227	485	451
185.	245	778	140
186.	265	337	561
187.	207	553	403
188.	237	718	208
189.	196	692	275
190.	382	710	71

N = 1163

* Number of subjects getting item right (R), wrong (W), or omitting (O) it.

Table 9

Difficulty level of CMT items expressed as proportions

Item	T*	A	Item	T	A
1.	9897	9905	45.	5907	6856
2.	9871	9888	46.	3181	3565
3.	9553	9611	47.	5228	7045
4.	9312	9320	48.	3396	4944
5.	9501	9542	49.	4050	5182
6.	9604	9688	50.	4807	7279
7.	7721	8377	51.	3500	5916
8.	9054	9261	52.	3697	4875
9.	9209	9289	53.	3947	6279
10.	9123	9348	54.	3216	3888
11.	8745	8813	55.	5133	6738
12.	9381	9520	56.	3431	6951
13.	5271	6998	57.	3448	5828
14.	8487	9347	58.	4944	6065
15.	7644	8324	59.	4987	6164
16.	6905	7911	60.	3706	5047
17.	8323	8651	61.	3371	6610
18.	6096	7774	62.	4935	6273
19.	5159	7255	63.	2236	2928
20.	6535	6872	64.	3508	6951
21.	7016	7691	65.	2674	3406
22.	5649	7483	66.	3199	6179
23.	7111	8196	67.	4282	6510
24.	6088	7755	68.	4910	6921
25.	6251	7148	69.	4695	5896
26.	5056	7626	70.	5185	6619
27.	7334	7920	71.	3276	6287
28.	5219	7430	72.	3646	4807
29.	6045	7381	73.	4463	5825
30.	7283	8044	74.	2769	5349
31.	5830	7370	75.	2872	5729
32.	4764	6977	76.	2571	3390
33.	5718	7540	77.	3078	5812
34.	4953	6628	78.	4256	6354
35.	6354	7450	79.	3629	4806
36.	6414	7667	80.	3061	4336
37.	7928	8601	81.	2700	5016
38.	8607	8819	82.	2984	6309
39.	5752	7186	83.	3061	4594
40.	2614	5324	84.	2287	3423
41.	3414	4932	84.	2476	4331
42.	4824	7137	86.	3138	5214
43.	5262	6830	87.	3242	5504
44.	3723	5419	88.	3199	4242

Table 9--Continued

Item	T	A	Item	T	A
89.	3095	6963	136.	8504	9015
90.	3061	4154	137.	8289	8623
91.	2494	4833	138.	8332	8691
92.	2941	5758	139.	8383	8464
93.	2545	3709	140.	6973	7406
94.	2296	5351	141.	8065	8093
95.	2941	5158	142.	7979	8247
96.	2279	5430	143.	6199	6443
97.	2528	5316	144.	6526	6875
98.	3164	6802	145.	5589	6366
99.	3431	4831	146.	7670	8131
100.	3293	5742	147.	4058	4958
101.	2502	3270	148.	7481	8004
102.	2330	4909	149.	7205	7509
103.	2167	4345	150.	4858	5325
104.	1763	3015	151.	3689	4269
105.	2623	5214	152.	6139	6704
106.	2674	6761	153.	8452	8738
107.	2253	2835	154.	5082	5727
108.	2769	5833	155.	4918	6015
109.	2717	5122	156.	4463	4731
110.	2064	4040	157.	2769	3052
111.	2244	4953	158.	7412	7981
112.	2691	5589	159.	3723	4606
113.	1737	2898	160.	3895	5641
114.	1290	1606	161.	4101	5085
115.	3095	5696	162.	5245	5680
116.	9630	9655	163.	6019	7551
117.	9372	9380	164.	1221	2113
118.	9372	9495	165.	5073	5438
119.	9441	9615	166.	5125	5815
120.	9596	9612	167.	4961	5403
121.	9837	9837	168.	3972	4400
122.	9845	9854	169.	3345	6234
123.	9699	9716	170.	4050	4645
124.	9854	9854	171.	7506	7837
125.	8633	8738	172.	3216	4437
126.	9097	9297	173.	1238	1427
127.	9914	9914	174.	3121	4624
128.	9243	9259	175.	6191	6344
129.	6225	7161	176.	2115	2891
130.	7334	7450	177.	2554	3136
131.	4067	5215	178.	4420	5908
132.	9235	9283	179.	2958	4687
133.	7334	7360	180.	3543	3883
134.	8555	8615	181.	3783	5978
135.	6604	6851	182.	1539	2613

Table 9--Continued

Item	T	A
183.	2046	3161
184.	1952	3188
185.	2107	2395
186.	2279	4402
187.	1780	2724
188.	2038	2482
189.	1685	2207
190.	3285	3498

N = 1163

* T = proportion of total group getting item right, A = proportion of those attempting item answering correctly; decimal point properly preceding each proportion has been eliminated.

Table 10

Distribution of carelessness scores (C) on CMT

Carelessness Score	Frequency
0	112
1	190
2	151
3	142
4	122
5	104
6	76
7	53
8	36
9	32
10	25
11	30
12	22
13	22
14	10
15	10
16	2
17	5
18	3
19	4
20	1
21	2
22	0
23	3
24	3
25	2
26	0
27	0
28	1

N = 1163

M = 4.54

SD = 4.26

Table 11

Comparison of careless and careful CMT subjects on CMT measures

	R*	W	O	C	R-W	R+W	$\frac{R-W}{R+W}$
				Careless subjects, N = 32			
M	94.00	93.75	2.25	17.00	20.97	167.03	.130
SD	7.01	6.76	5.41	3.68	11.24	5.69	.057
				Careful subjects, N = 32			
M	54.28	44.72	91.00	2.06	21.31	87.25	.310
SD	17.58	25.49	41.16	1.73	11.38	37.13	.209
diff. in M's	39.72	49.03	88.75	14.94	.34	79.78	.180
t	11.68	10.35	11.90	20.43	.12	11.83	4.65

sig. level for 60 d.f

.10 = 1.67
.05 = 2.00
.01 = 2.66
.001 = 3.46

* R--right, W--wrong, O--omitted, C--carelessness score.

Some of the subjects in these two samples had also taken the D-48, 20 careless and 23 careful subjects. The D-48 measures for the subsamples of CMT-selected students is given in Table 12. Again, as we found in the previous analysis, the C means do not differ ($t = 1.28$) although the difference is in the appropriate direction. Significances close to or beyond the .001 level occurred for the following measures: R, $t = 3.08$; W, 4.17; R-W, 3.89; R-W/R+W, 4.12. The R+W at 2.63 is close to the .01 level and Omitted almost makes the .05 level.

Another analysis was made of the relationship of carelessness on CMT scores by comparing the 50 subjects scoring highest on C (C 13 or more) with a random selection of 50 from the 112 subjects who had zero C scores. No attempt was made to match them on total score--R-W on this test. The means and standard deviations for the test measures are given in Table 13. All of the t's are significant far beyond the .001 level except for R, which is non-significant. Thus, although the two samples get about the same number of items correct, the careless subjects tended to omit fewer items but to get more items wrong. They averaged only a little better than 8 per cent right of the items attempted. The careful subjects, on the other hand, got almost two-thirds of the items attempted correct. By omitting more items and by getting fewer items wrong, the careful subjects end up with a total score that averages 62 raw score points higher than the careless subjects.

The intratest correlations for the seven test measures are given in Table 14 for the D-48 and in Table 15 for the CMT; in addition Table 16 gives the correlations for Part 1 of the CMT and Table 17 for Part 2.

For the D-48 the test score, R, shows a significant negative correlation, -.77, with the number of incorrect answers, W. The number of omitted items, O, and the number of careless errors, C, both show negative correlations of about the same magnitude, -.31 and -.34 respectively, with R. It is of interest to note that R-W correlates .94 with R; thus, had a "correction" formula been used and wrongs subtracted from rights, the relative standing of subjects would not have been greatly altered.

Carelessness is significantly but not highly related to wrongs, $r = .36$, but is unrelated to the number omitted or its obverse, the number attempted. No doubt the restriction of range for C has attenuated the relationship with these measures.

In sum, then, subjects who scored highest on the D-48 tended to answer more items and to omit fewer; they made fewer errors of all kinds, including careless errors.

On the CMT, however, a somewhat different pattern of relationship among the test measures may be seen in Table 15. Rights and wrongs show a very low positive correlation, .09 (with $N = 1163$ an r of .075 is needed for significance at the .01 level) indicating that there is only a slight tendency for subjects who got more items right also to get more items wrong. The number omitted is highly negatively correlated with R, -.73; this may be contrasted with the value of only -.31 obtained on the D-48 for these measures. Careless errors are not related since a non-significant r of .04 was obtained between R and C.

Table 12

Comparison of careless and careful CMT subjects on D-48 measures

	R*	W	O	C	R-W	R+W	$\frac{R-W}{R+W}$
Careless subjects, N = 20							
M	20.90	19.80	3.30	.65	1.10	40.70	.040
SD	6.94	8.32	4.29	.73	14.71	4.29	.360
Careful subjects, N = 23							
M	26.75	11.09	6.17	.39	15.65	37.83	.420
SD	5.19	4.82	4.83	.57	8.85	2.59	.222
diff. in M's	5.85	8.71	2.87	.26	14.55	2.87	.380
t	3.08	4.17	2.00	1.28	3.89	2.63	4.12

sig. level for 40 d.f.

.05 = 2.02
.01 = 2.70
.001 = 3.55

* R--right, W--wrong, O--omitted, C--carelessness score.

Table 13

Comparison of most careless and most careful subjects on CMT measures

	R*	W	O	C	R-W	R+W	$\frac{R-W}{R+W}$
	Careless subjects, N = 50						
M	89.34	98.08	2.58	17.40	12.82	165.86	.076
SD	10.00	8.62	6.74	3.88	15.54	7.33	.095
	Careful subjects, N = 50						
M	96.62	23.68	73.70	0.00	74.84	110.40	.667
SD	26.13	8.99	26.94	0.00	26.40	27.66	.137
diff. in M's	3.28	74.40	71.12	17.40	62.02	55.46	.591
t	.82	41.82	17.93	31.41	14.17	13.57	24.11

sig. level for 100 d.f.

.05 = 1.98
.01 = 2.63

* R--right, W--wrong, O--omitted, C--carelessness score.

Table 14

Intratest correlations of D-48

N = 770

	W	O	C	R-W	R+W	$\frac{R-W}{R+W}$
R	-77	-31	-34	94	31	85
W		-36	36	-94	36	-98
O			(-04)[a]	(03)	-100	22
C				-37	(04)	-37
R-W					(-03)	98
R+W						-22

Table 15

Intratest correlations of CMT

N = 1163

	W	O	C	R-W	R+W	$\frac{R-W}{R+W}$
R	09	-73	(04)	73	80	25
W		-75	80	-62	66	-92
O			-57	(-06)	-99	46
C				-51	49	-71
R-W					17	83
R+W						-36

[a] Non-significant r enclosed in parentheses.

The CMT score, R-W since it is "corrected," correlates .73 with R, a value much lower than that obtained on the D-48. On the other hand, a much higher value, .80, is obtained with the total number attempted.

Before summarizing these relationships it is instructive to look at Tables 16 and 17 where the correlations have been given separately for the two parts of the CMT. Rights and wrongs are correlated significantly positively, .40, for Vocabulary, but significantly negatively, -.51, for Analogies. Thus, there was in general a tendency for subjects who got more items right also to get more Vocabulary items wrong but to get fewer Analogies items wrong. Likewise the number omitted is much more strongly related to R for Vocabulary, -.85, than for Analogies, -.41. Careless errors show an opposite trend with R and C positively correlated, .26, for Vocabulary but having a negative value, -.28, for Analogies. Further, the test score shows meaningful differences between the two parts; R and R-W is correlated .60 for Vocabulary and .94 for Analogies. This latter value is the same as that obtained for the comparable measures on the D-48.

The pattern of correlations for the measures on the total CMT obscures what seems to be somewhat different relations on the two parts. This finding is amplified in Tables 18, 19, and 20 where the intertest correlations are given between the D-48 and the CMT total and the parts. The correlation for R on the D-48 and Vocabulary is a non-significant .07 but rises to .42 for Analogies. D-48 R scores are more highly correlated with Analogies wrongs, -.43, than with Vocabulary W, -.29. The number attempted on the CMT is negatively correlated with the number right on the D-48, -.13, for Vocabulary but positively, .19, for Analogies. A reversed pattern for D-48 wrongs is found, .22 and -.13 respectively.

Finally, total score on the D-48, R, correlates .33 with Vocabulary R-W on the CMT but .49 with Analogies. It seems clear that Part 2 of the CMT is more closely related to the D-48 than Part 1.

Further evidence for this claim may be seen in the intratest correlations for all of the measures on the CMT presented in Table 21 for Vocabulary and Analogies, Table 22 for Vocabulary and Total, and in Table 23 for Analogies and Total. The diagonal entries representing the same measures have been underlined for ease in reading the tables. Rights are less strongly related than wrongs, .56 and .73, for Vocabulary and Analogies as shown in Table 21. Careless errors correlate .52 and the test score itself, R-W, shows a value of .72. Further comment about this latter relationship will be made below.

Comparison of Tables 22 and 23 shows that Vocabulary measures are more highly correlated with Total than Analogies. For example, the values for rights are .95 and .80; for wrongs, .96 and .90; for omitted, .98 and .85; for carelessness, .89 and .72; and for the test score itself, R-W, .95 and .90. No doubt these values are related to the greater number of items in Vocabulary, 115, as compared to 75 items in Analogies, but the discrepancy for C, .89 as contrasted with .72, indicates that Vocabulary carelessness contributed proportionally much more to total C than did Analogies C.

Table 16

Intratest correlations of CMT, part 1 (Vocabulary)

N = 1163

	W	O	C	R-W	R+W	$\frac{R-W}{R+W}$
R	40	-85	26	60	85	08
W		-82	80	-49	82	-83
O			-62	-10	-100	43
C				-45	62	-66
R-W					10	80
R+W						-43

Table 17

Intratest correlations of CMT, part 2 (Analogies)

N = 1163

	W	O	C	R-W	R+W	$\frac{R-W}{R+W}$
R	-51	-41	-28	94	83	72
W		-58	54	-77	07	-95
O			-31	(-06)[a]	-84	33
C				-43	(03)	-53
R-W					57	91
R+W						21

[a] Non-significant r enclosed in parentheses.

Table 18

Intertest correlations of D-48 and total CMT measures

N = 770

	CMT						
D-48	R	W	O	C	R-W	R+W	$\frac{R-W}{R+W}$
R	.21	-.37	.12	-.44	.44	-.12	.44
W	-.16	.47	-.21	.52	-.48	.21	-.50
O	(-.06)[a]	-.16	.15	-.13	(.07)	-.15	.10
C	(-.08)	.17	(-.06)	.16	-.19	(.06)	-.18
R-W	.20	-.44	.17	-.51	.49	-.17	.50
R+W	(.06)	.16	-.15	.13	(-.07)	.15	-.10
$\frac{R-W}{R+W}$	.19	-.46	.19	-.51	.50	-.18	.51

[a] Non-significant r enclosed in parentheses.

Table 19

Intertest correlations of D-48 and CMT measures: part 1 (Vocabulary)

N = 770

	CMT						
D-48	R	W	O	C	R-W	R+W	$\frac{R-W}{R+W}$
R	(07)[a]	-29	13	-36	33	-13	34
W	(-01)	40	-22	47	-37	22	-42
O	(-07)	-17	14	-17	(08)	-14	13
C	(-03)	15	(-07)	17	-16	(07)	-15
R-W	(04)	-37	18	-44	37	-18	40
R+W	(07)	17	-14	17	(-08)	14	-13
$\frac{R-W}{R+W}$	(04)	-37	20	-45	38	-20	42

Table 20

Intertest correlations of D-48 and CMT measures: part 2 (Analogies)

	CMT						
D-48	R	W	O	C	R-W	R+W	$\frac{R-W}{R+W}$
R	42	-43	(06)	-38	49	19	49
W	-40	49	-15	42	-50	-13	-53
O	(-02)	-11	13	(-08)	(03)	(-09)	(07)
C	-16	18	(-04)	11	-19	(-06)	-19
R-W	43	-49	11	-42	52	17	54
R+W	(02)	11	-13	(08)	(-03)	(09)	(-06)
$\frac{R-W}{R+W}$	43	-49	13	-42	52	16	54

[a] Non-significant r enclosed in parentheses.

Table 21

Intratest correlations of CMT part 1 (Vocabulary) and part 2 (Analogies)

N = 1163

	Part 1						
Part 2	R	W	O	C	R-W	R+W	$\frac{R-W}{R+W}$
R	56	08	-61	(06)[a]	37	70	10
W	-17	73	-61	41	-42	28	-62
O	-25	-47	73	-27	(01)	-60	30
C	-34	73	-45	52	-55	09	-69
R-W	68	-56	(-05)	-30	72	42	63
R+W	25	47	-73	27	(-01)	60	-30
$\frac{R-W}{R+W}$	45	-72	34	-39	62	(05)	71

[a] Non-significant r enclosed in parentheses.

Table 22

Intratest correlations of CMT total test and part 1 (Vocabulary)

N = 1163

	Total CMT						
Part 1	R	W	O	C	R-W	R+W	$\frac{R-W}{R+W}$
R	95	29	-83	25	55	88	(04)[a]
W	22	96	-81	72	-50	75	-84
O	-72	-73	98	-57	(-06)	-98	46
C	(06)	83	-61	89	-53	54	-74
R-W	71	-55	-09	-39	95	18	77
R+W	72	73	-98	57	(06)	98	-46
$\frac{R-W}{R+W}$	23	-84	43	-59	78	-35	95

Table 23

Intratest correlations of CMT total test and part 2 (Analogies)

	Total CMT						
Part 2	R	W	O	C	R-W	R+W	$\frac{R-W}{R+W}$
R	80	-33	-31	-37	84	41	57
W	-14	90	-53	77	-70	41	-87
O	-61	-64	85	-47	(-06)	-82	39
C	(-07)	50	-30	72	-38	23	-47
R-W	64	-61	(-01)	-59	90	13	77
R+W	83	21	-70	(07)	52	74	09
$\frac{R-W}{R+W}$	35	-81	32	-73	80	-19	88

[a] Non-significant r enclosed in parentheses.

To advance the argument further, Table 24, a rearrangement of Table 19, has been made so that the comparable test measures for Vocabulary and Analogies are in parallel rows. Thus, Vocabulary rights correlate .68 with Analogies scores, R-W, but Analogies rights show only .37 with Vocabulary R-W. Vocabulary wrongs are more negatively correlated with Analogies scores, -.56, than Analogies wrongs are correlated with Vocabulary scores, -.42. On the other hand, Vocabulary carelessness is less highly related, -.30, to Analogies scores than Analogies carelessness is to Vocabulary scores, -.55. The patterns of the intratest correlations seem to indicate that the test score and the test measures are different for the two parts of the CMT. This is advanced as further support for the point made above that important relationships may be overlooked if the total score and measures are accepted without examining the same relationships for the two parts.

The CMT Manual (Terman, 1956) reports correlations between scores on the two parts of the test as .75 for 331 undergraduate and graduate students and as .76 for the 1004 subjects of the Stanford Gifted Study. It is pointed out (p. 8) that "no use has been made of either subtest alone. . . .The coefficients show that the two parts have much in common, in terms of measurement, and that the use of a total score is justified. However, there is still enough difference between the parts to indicate that they are different approaches to the measurement of mental ability."

Analysis of the two scores on the Governor's School subjects clearly supports the differences between the parts noted in the Manual and the present writer strongly urges that part scores as well as total scores be reported and that further study of the correlates of the part scores be made with different types of subjects.

Personality Measures. The results of the correlational analysis for the intelligence test measures and the personality measures are presented in Table 25 for the D-48 and in Table 26 for the CMT. To simplify the presentation of these data and to avoid cluttering the tables non-significant correlations have been enclosed in parentheses; non-significance in this case means that the correlation coefficient did not differ significantly from zero at the .05 level for a one-tailed test or at the .10 level for a two-tailed test.

Since some of the correlations were in a direction contrary to expectation, the two-tailed test was used to indicate their departure from zero. The actual level of significance for the other correlations will be given below in appropriate sections.

1. Anxiety: On the D-48 test scores were negatively correlated with the MMPI A scale as predicted. For males the correlation of R, the number correct, and A was -.17, significant beyond the .001 level; for females the value was lower, -.09, and lies close to the .025 level.

The A scale was unrelated to the number wrong, W, for males (r = .07) and the value for females, .08, is barely significant at the .10 level for a one-tailed test. It was predicted that anxious subjects would be less inclined to guess so that they should have fewer wrong answers but

Table 24

Intratest correlations of measures on CMT Vocabulary and Analogies

N = 1163

	Analogies/Vocabulary measure						
	R	W	O	C	R-W	R+W	$\frac{R-W}{R+W}$
V*--R	56	-17	-25	-34	68	25	45
A --R	56	08	-61	(06)[a]	37	70	10
V--W	08	73	-47	73	-56	47	-72
A--W	-17	73	-61	41	-42	28	-62
V--O	-61	-61	73	-45	(-05)	-73	34
A--O	-25	-47	73	-27	(01)	-60	30
V--C	(06)	41	-27	52	-30	27	-39
A--C	-34	73	-45	52	-55	09	-69
V--R-W	37	-42	(01)	-55	72	(-01)	62
A--R-W	68	-56	(-05)	-30	72	42	63
V--R+W	70	28	-60	09	42	60	(05)
A--R+W	25	47	-73	27	(-01)	60	-30
V--$\frac{R-W}{R+W}$	10	-62	30	-69	63	-30	71
A--$\frac{R-W}{R+W}$	45	-72	34	-39	62	(05)	71

* V--Vocabulary, A--Analogies.

[a] Non-significant r enclosed in parentheses.

Table 25

Correlations of D-48 measures with personality measures

	Males							Females						
	R	W	O	C	R-W	R+W	R-W / R+W	R	W	O	C	R-W	R+W	R-W / R+W
	(N = 350)							(N = 416)						
MMPI														
Pd	-19	(08)	16	(04)	-14	-16	-11	-19	16	(05)	13	-19	(-05)	-18
Ma	-22	22	(-01)	(04)	-23	(01)	-22	-13	18	(-07)	12	-17	(07)	-18
A	-17	(07)	14	(-01)	-12	-14	-10	-09	08	(03)	09	-09	(-03)	-08
	(N = 350)							(N = 416)						
ACL														
Lability	16	-13	(-04)	(-03)	15	(04)	14	(02)	(01)	(-04)	(04)	(01)	(04)	(00)
Need Change	(02)	(01)	(-05)	(03)	(01)	(05)	(01)	(-02)	(05)	(-05)	(06)	(-04)	(05)	(-05)
Self-Control	(06)	(-01)	(-07)	(-06)	(04)	(07)	(03)	(06)	(-01)	(-07)	(01)	(04)	(07)	(03)
Need Order	(05)	(04)	-15	-12	(00)	15	(-02)	(04)	(05)	-13	(-01)	(00)	13	(-03)
Need Abasement	-10	(02)	11	(01)	(-06)	-11	(-04)	(01)	(-07)	08	09	(05)	-08	(07)
Self-Confidence	(02)	(07)	-14	(-04)	(-02)	14	(-04)	(02)	(07)	-13	(01)	(-02)	13	(-06)
Counseling Readiness	(05)	-18	21	(-08)	13	-21	15	(04)	(-06)	(04)	(00)	(06)	(-04)	(06)
	(N = 350)							(N = 419)						
SVIB														
Advertising Man	-12	(04)	11	(05)	-09	-11	(-07)	-13	(06)	10	(02)	-10	-10	-09
Lawyer	(00)	(-05)	(07)	(03)	(03)	(-07)	(04)	(-07)	(01)	08	(02)	(-04)	-08	(-03)
Author-Journalist	(-02)	(-07)	15	(03)	(03)	-15	(05)	-11	(01)	14	(01)	(-06)	-14	(-04)

(Correlations enclosed in parentheses are non-significant at .05 level for one-tailed or .10 for two-tailed test. Decimal point properly preceding each entry has been eliminated.)

Table 26

Correlations of CMT measures with personality measures

	Males							Females						
	R	W	O	C	R-W	R+W	R-W / R+W	R	W	O	C	R-W	R+W	R-W / R+W
	(N = 527)							(N = 622)						
MMPI														
Pd	-11	(06)	(04)	08	-13	(-05)	-09	-08	19	-08	21	-18	(05)	-22
Ma	-11	17	(-05)	18	-20	(02)	-21	(-06)	21	-10	22	-19	07	-24
A	-12	(06)	(04)	09	-13	(-05)	-10	(-02)	(06)	(-03)	(06)	(-05)	(02)	(-06)
	(N = 527)							(N = 624)						
ACL														
Lability	(06)	-13	(05)	-14	14	(-03)	15	14	(-05)	(-05)	-08	15	07	10
Need Change	(03)	(04)	(-05)	(01)	(00)	(05)	(-03)	07	(02)	(-06)	(02)	(04)	(06)	(00)
Self-Control	-08	(-06)	09	-07	(-02)	-09	(03)	-07	(-03)	07	(-03)	(-04)	-07	(01)
Need Order	(01)	(-07)	(04)	-08	(05)	(-03)	08	(-01)	(00)	(01)	(-02)	(-01)	(-01)	(-01)
Need Abasement	-11	(-04)	10	(01)	(-06)	-10	(01)	-09	(01)	(05)	(02)	-09	(-06)	(-03)
Self-Confidence	09	(03)	-08	(-01)	(05)	08	(01)	08	(06)	-09	(03)	(02)	09	(-03)
Counseling Readiness	07	-17	07	-12	17	(-04)	18	32	-17	-10	-17	37	14	28
	(N = 529)							(N = 632)						
SVIB														
Advertising Man	(06)	(01)	(-04)	07	(04)	(04)	(00)	08	(03)	-07	(05)	(05)	07	(00)
Lawyer	23	-13	-07	-08	27	10	18	16	(00)	-10	(00)	13	11	(06)
Author-Journalist	18	-10	(-05)	(-04)	22	08	13	15	(-05)	-07	(-01)	15	08	10

(Correlations enclosed in parentheses are non-significant at .05 level for one-tailed or .10 for two-tailed test. Decimal point properly preceding each entry has been eliminated.)

these data do not support this hypothesis. The extension of the prediction to the number of omitted items, however, was confirmed partially; for males A and O were correlated in the expected direction, r = .14 (close to .005 level), but for females the value of .03 was non-significant. Although no predictions were made about the relationship of careless errors and anxiety, it was found that for females the obtained correlation, .09, lies close to the .05 level.

It is of interest to note that had a "correction" been used, the relationship of anxiety and intelligence test performance would not be greatly altered; that is, the correlations of A and R-W are quite similar (identical for females) to the A and R correlations. The same observation is true when the test scores are expressed as ratios in the last column.

Anxiety seems to be less strongly associated with performance on the CMT. For females the correlation of A and R-W is non-significant (r = -.05) and for males the value of -.13, although significant at the .005 level, is lower than its D-48 counterpart.

Other significant correlations with A for males are: R, -.12 (.005 level); C, .09 (.025 level); R-W/R+W, -.10 (.01 level). For females two correlations, both .06 (close to the .05 level), appear for W and C.

The other anxiety measure employed was the Adjective Check List Counseling Readiness scale, Crs. It should be noted that this scale has two versions, one for males and one for females, so that the resulting correlations for the two sexes cannot be compared directly.

On the D-48 none of the correlations for females was significant but all except the test score, R (r = .05) were for males. These correlations and their levels of significance are: W, -.18 (.0005 level); O, .21 (.0005 level); C, -.08 (close to .05 level); R-W, .13 (.01 level); R+W, -.21 (.0005 level); and R-W/R+W, .15 (.01 level). Thus males who are anxious in the sense of the Crs scale tended to have fewer wrong answers, to omit more (or attempt fewer) items, but to have proportionately more correct answers.

The results with the CMT scores show even more clearly that the results are contrary to the hypothesis that anxiety is negatively related to intelligence test performance. Both males and females show significant positive correlations of R-W with Crs; the respective values of .17 and .37 both surpass the .001 level. The other significant correlations for males are: R, .07 (.10 level); W, -.17 (.001 level); O, .07 (.10 level); C, -.12 (.01 level); and R-W/R+W, .18 (.001 level). For females significant correlations are: R, .32 (.0005 level); W, -.17 (.001 level); O, -.10 (.02 level); C, -.17 (.001 level); R+W, .14 (.001 level); and R-W/R+W, .28 (.0005 level). Both sexes, then, showed a similar pattern on the CMT and Crs to that indicated for males on the D-48.

The ACL Manual (p. 9) describes the Counseling Readiness scale as being related to the "clinical concept of 'available anxiety'" and states that "the high-scorer on Crs is predominantly worried about himself and

ambivalent about his status. He feels left out of things, unable to enjoy life to the full, and unduly anxious." The results cited above seem to indicate that for the present subjects the kind of anxiety tapped by Crs is positively rather than negatively related to intelligence.

The ACL Self-Confidence scale may be considered in some ways as the obverse of anxiety since the Manual (p. 6) states that indicative adjectives on S-Cfd include "clear-thinking" and "patient." On the D-48 none of the measures were significantly correlated except for the number omitted and its opposite, the number attempted. For males an r between S-Cfd and O of -.14 was obtained with a comparable value of -.13 for females; these are significant at the .005 level for both sexes. The values for R+W are, of course, the same except for the reversal of sign.

On the CMT O and S-Cfd give r's of -.08 for males (.05 level) and -.09 for females (.025 level); the values for R+W with reversed sign are in this instance exactly the same. Males show one additional significant correlation, .09 with R (.025 level) and females show two, .08 with R (.025 level) and .06 with W (.05 level). The self-confident subject, then, is somewhat inclined to attempt more items although his overall intellectual performance is no higher than those less self-confident.

It has been noted above that the MMPI anxiety scale, A, showed a negative correlation with total scores on the D-48 and the CMT although the r of -.05 for the girls on the CMT failed to reach a nominal level of significance. Since there is some evidence that anxiety measures may have a non-linear relationship to intellectual test scores, the scatterplots for the two tests were examined for this possibility. No evidence of curvelinearity was apparent.

A further analysis was made by grouping the subjects according to A scale level in five-point intervals; the sexes were treated separately. The mean scores of these eight anxiety levels for the D-48 and the CMT are shown in Table 27. Some tendency may be seen for the lower levels of A to have higher means on the intellectual measures as would be expected from the correlational study. The differences between the means, however, proved not to be significant when examined by analysis of variance. The F's obtained are shown in the table.

Thus, although there is some negative relatioship between anxiety and intellectual performance as measured by these tests, it does not seem to be an important source of variance in accounting for individual differences in intelligence test scores.

2. Impulsiveness: The two MMPI scales used to measure impulsiveness, Pd and Ma, both showed similar patterns of correlations for both sexes on the two intelligence tests as is clear from Tables 25 and 26.

On the D-48 significant correlations with Pd for males are: R, -.19 (.0005 level of significance); O, .16 (.005 level); R+W, -.16; R-W, -.14 (.005 level); and R-W/R+W, -.11 (.025 level). For females the significant correlations are: R, -.19 (.0005 level); W, .16 (.005 level); C, .13 (.005 level); R-W, -.19 (.0005 level); and R-W/R+W, -.18 (.0005 level).

Table 27

Relation of scores on intelligence tests to levels of MMPI Anxiety scale, A

Score on A scale	Males N	Males Mean CMT R-W score	Females N	Females Mean CMT R-W score
0-4	71	70.97	63	58.63
5-9	115	61.23	121	55.20
10-14	114	59.95	129	51.19
15-19	90	60.16	132	52.95
20-24	79	57.99	86	54.37
25-29	29	59.72	50	58.54
30-34	27	57.19	35	47.77
35-39	6	40.67	10	43.80
Totals	531	61.07	626	53.80

Score on A scale	Males N	Males Mean D-48 R score	Females N	Females Mean D-48 R score
0-4	42	31.10	39	29.87
5-9	78	30.18	91	30.48
10-14	74	31.19	90	29.08
15-19	64	29.39	83	28.96
20-24	53	30.25	60	30.00
25-29	16	28.81	26	28.65
30-34	20	27.30	23	29.26
35-39	4	19.25	7	23.00
Totals	351	30.02	419	29.45

Values of F

	Males	Females
D-48	1.00	1.00
CMT	1.86	1.11

The Ma correlations with the D-48 measures for males are all significant beyond the .0005 level: R, -.22; W, .22; R-W, -.23; and R-W/R+W, -.22. For females they are: R, -.13 (.005 level); W, .18 (.0005 level); C, .12 (.01 level); R-W, -.17 (.0005 level); and R-W/R+W, -.18 (.0005 level).

The subject high on Pd and on Ma, then, tends on the D-48 to get more items wrong and fewer items right and thus to obtain lower test scores. In addition high Pd-Ma females tend to make more careless errors.

On the CMT males show a Pd correlation of -.11 with R (.01 level), .08 with C (.05 level), -.13 with R-W (.005 level), and -.09 with R-W/R+W (.025 level). For females the values are: R, -.08 (.025 level); W, .19 (.0005 level); O, -.08 (.025 level); C, .21 (.0005 level); R-W, -.18 (.0005 level); and R-W/R+W, -.22 (.0005 level).

For Ma the significant r's for males are: R, -.11 (.01 level); W, .17 (.0005 level); C, .18 (.0005 level); R-W, -.20 (.0005 level); R-W/R+W, -.21 (.0005 level). Comparable values were obtained with females: R, -.06 (.05 level); W, .21 (.0005 level); O, -.10 (.01 level); C, .22 (.0005 level); R-W, -.19 (.0005 level); R+W, .07 (.05 level); and R-W/R+W, -.24 (.0005 level).

Pd and Ma are associated on the CMT with tendencies to get more items wrong and fewer items right with resulting lower test scores and also to make more careless errors. In females there is a tendency to omit fewer items.

The two ACL scales, Lability and Need Change, included as measures of impulsiveness showed very few significant correlations with the intelligence test measures and these tended to be contrary to expectation.

For the D-48 only males showed significant correlations and all of these were on Lability: R, .16 (.01 level); W, -.13 (.02 level); R-W, .15 (.01 level); and R-W/R+W, .14 (.01 level).

Both sexes had some significant correlations on the CMT and Lability but only females showed any on Need Change. The values for males on Lability are: W, -.13 (.01 level); C, -.14 (.01 level); R-W, .14 (.01 level); and R-W/R+W, .15 (.001 level). For females they are: R, .14 (.001 level); C, -.08 (.05 level); R-W, .15 (.001 level); R+W, .07 (.10 level); and R-W/R+W, .10 (.02 level). Low correlations on a few measures for females on Need Change appeared as follows: R, .07 (.10 level); O, -.06; and R+W, .06 (close to .10 level).

It must be concluded that the Lability and Need Change scales on the ACL for the present subjects are probably unrelated to the intellectual measures.

3. Caution: On the D-48 none of the measures are significantly correlated with Self-Control for either sex. On Need Order significant correlations for males are: O, -.15; and R+W, .15 (.01 level); C, .12 (.01 level). For females only O, -.13; and R+W, .13 (.01 level) reached nominal significance. Need Abasement showed a few significant correlations for each sex. For males they are: R, -.10 (.10 level); O, .11;

and R+W, -.11 (.05 level). For females they are: O, .08; and R+W, -.08 (.10 level); C, .09 (.075 level).

The CMT measures also showed very few significant correlations with the ACL measures of caution. On Self-Control for males the r's are: R, -.08 (.10 level); but in the expected direction, O, .09; and R+W, -.09 (.05 level) as well as C, -.07 (.10 level). A similar pattern is found for females: R, -.07; O, .07; R+W, -.07 (.10 level).

On Need Order there are no significant correlations for females and only two for males: R, -.08; R-W/R+W, .08 (.05 level). Need Abasement shows the following r's for males: R, -.11 (.02 level); O, .10; and R+W, -.10 (.01 level). For females they are: R, -.09; R-W, -.09 (.05 level); R+W, -.06 (.10 level).

It is apparent that caution as inferred from the ACL scales for Self-Control, Need Order, and Need Abasement is not systematically related to the two intelligence tests.

4. Verbal Interests: There were few significant correlations of the D-48 measures and the verbal interest scale of the Strong. Advertising Man showed the following for males: R, -.12 (.05 level); O, .11; and R+W, -.11 (.10 level); R-W, -.09 (.10 level). None of the measures for males on Lawyer were significant and on Author-Journalist only O and R+W, .15 and -.15 (.01 level) appear. A similar pattern may be seen for females. Advertising Man has: R, -.13 (.01 level); O, .10; and R+W, -.10 (.05 level); R-W, -.10 (.05 level). On Lawyer r's of .08 for O and -.08 for R+W (.10 level) emerge. Author-Journalist has significant correlations on R, -.11 (.05 level); and on O, .14; and R+W, -.14 (.01 level).

As expected, scores on the D-48 are basically unrelated to verbal interests although there may be a slight tendency for a negative relationship, particularly in females.

On the CMT the expected positive relationship was sustained by only two of the scales. Advertising Man showed no significant correlations for males and only three for females: R, .08 (.025 level); O, -.07; and R+W, .07 (.05 level). Lawyer was significantly correlated with all of the CMT measures for males: R, .23 (.0005 level); W, -.13 (.005 level); O, -.07 (.05 level); R-W, .27 (.0005 level); R+W, .10 (.01 level); R-W/R+W, .18 (.005 level). For females the r's are: R, .16 (.0005 level); O, -.10 (.01 level); R-W, .13 (.0005 level); R+W, .11 (.005 level). Author-Journalist and CMT measure correlations for males are: R, .18 (.0005 level); W, -.10 (.01 level); R-W, .22 (.0005 level); R+W, .08 (.05 level); R-W/R+W, .13 (.005 level). For females the values are: R, .15 (.0005 level); O, -.07 (.05 level); R-W, .15 (.0005 level); R+W, .08 (.025 level); R-W/R+W, .10 (.01 level).

Thus two of the verbal interest scales on the Strong, Lawyer and Author-Journalist, show marked relationship to performance on the CMT in the expected direction. This tendency is somewhat stronger for males than females.

The findings with the D-48 and the CMT support the previous report (Welsh, 1967) that subjects with higher verbal interests tend to do better on a verbal test of intelligence.

It has been noted above (p. 32) that the two parts of the CMT show different correlational patterns and that CMT Analogies seems more like the D-48 in this respect than Vocabulary. The correlations of R-W scores on Vocabulary and Analogies for the three verbal-linguistic scales are:

	Vocabulary		Analogies	
	m	f	m	f
Advertising Man	.10	.09	-.04	-.02
Lawyer	.28	.16	.21	.07
Author-Journalist	.22	.19	.17	.08

It is apparent that these part-score correlations are consistent with the suggestion that the correlates of the two CMT parts may reveal relations obscured by the total score. In these data all three Strong scales are more highly positively correlated with Vocabulary than with Analogies; this is true for males and for females.

Conclusions and Recommendations

Both of the intelligence tests proved to be suitable for the gifted and talented adolescent subjects studied in this research. These students had no difficulty in following the instructions and responding to the test items. It was observed informally that they seemed to enjoy the D-48 more than the CMT and many of them made spontaneous comments to the present writer at the conclusion of the testing session to this effect. Some of the comments were: "that was neat," "lots of fun," "will we have more tests like that one?" and "that's the best yet." A few said that they had tried harder on the D-48 to "get them all right" than they had on the CMT.

Some of the subjects raised questions about guessing on the CMT and it may well be that for many this was a reflection of the rights-minus-wrongs scoring penalty frequently employed in educational settings. For others, however, it may have been a fear that they would find the words in the Vocabulary part too difficult. There is no doubt that forewarning of test difficulty was passed around from one group of subjects to the next. All of the testing at the Governor's School was done with separate groups on different days over a four-week period of time according to a prearranged schedule and, although they were asked not to discuss any particular test with their fellows until all groups had completed that test, it is unlikely that the admonition was adhered to strictly.

The distribution of scores on the CMT, however, as well as those on the D-48 resulted in a wide range of scores even with this highly selected and motivated population; and, furthermore, the correlations between these two tests as well as with the personality and interest measures were for the most part consistent with expectations derived generally from previous studies.

While attending the Governor's School the students were not given any grades or marks on their work so that there is no way to demonstrate directly the relationship between these intelligence test scores and academic achievement. The CMT Manual cites evidence of positive correlation with college grades and Gough and Domino (1963) report correlations of D-48 scores with grades for fifth and sixth grade pupils as .49 and .32.

In most of the classes at the school, however, the teachers ranked their students on a number of dimensions including intellectual competence and amount of progress. It would be possible to convert these ranks to scores and correlate them with the CMT and the D-48.

Both of the tests may be vulnerable to the effects of anxiety since scores on both were negatively correlated with the A scale of the MMPI. It must be noted, though, that the overall trend is relatively slight. The highest correlation obtained, -.17, on the D-48 and A for males, would still account for less than 3 per cent of the variance. In the present study no marked decrement in intellectual scores seems to appear

except at the highest anxiety score level; this relationship should be explored further.

The effect of impulsiveness as measured by the Pd and Ma scales of the MMPI seems to be somewhat stronger than that of anxiety. Significant negative correlations were obtained for both sexes on both scales for both intelligence tests but, even so, only about 5 per cent of the variance would be explained by the highest correlation shown, -.22 on the D-48 and Ma for males. There is evidence (Dahlstrom and Welsh, 1960) that many socially unfavorable personality characteristics are associated with MMPI profiles having peak scores on Pd and Ma. It would be instructive to identify a subgroup of the present subjects with the Pd-Ma profile configuration (code type 49, Dahlstrom and Welsh, p. 192) and study intensively their other psychometric features.

The significant positive correlation of the Adjective Check List Counseling Readiness scale with CMT scores was unexpected. The magnitude of the correlation for females of .37 is almost at the level for the two intelligence tests themselves. The ACL Manual reports non-significant correlations of Crs with intellectual measures for 100 male subjects. Thus it is difficult to judge whether the correlations noted in the present study are more or less fortuitous or whether there is in fact a meaningful relationship. Additional studies may indicate the fruitfulness of further investigation of this scale and its implication for intellectual performance.

Verbal interest as measured by two of the Strong VIB scales, Lawyer and Author-Journalist, was not related to D-48 scales but showed the expected positive correlation with the CMT. From one point of view this finding implies that the subject lacking in verbal interest is not handicapped on the D-48 but that he might do less well on the CMT. On the other hand, it might be argued that since school achievement is often related to verbal facility, the CMT may be a better predictor of academic success than the D-48. This lead should surely be followed up with other types of subjects and in other settings.

An important unpredicted finding is that of a different pattern of intercorrelations for the two parts of the CMT with other measures used in this study and the apparent greater similarity of Analogies to the D-48 in this regard. These results are compatible with the report of Horn and Bramble (1967) where they show a second order factor of "fluid intelligence," on which the D-48 has the highest loading of all the tests in their battery. Another of their major second order factors, "crystallized intelligence," identified by the primary factor of verbal comprehension is measured in their study by a test of general information; this dimension seems to be similar to CMT Vocabulary in terms of intellectual functions. The present writer urges that studies employing the CMT use part scores as well as the total; the part scores should be correlated with personality and interest measures as well as with other intellectual measures. The pattern of scores for the present subjects might be examined to identify subgroups differing on whether the scores are relatively higher on Vocabulary or on Analogies. An intensive study of the other test measures available could then be carried out.

Horn and Bramble were interested in rights-scores and wrongs-scores in their study. In interpreting their results they comment:

> When a test is scored by the wrongs-score procedure, the person who adopts a strategy of avoiding errors has the advantage; when the same test is scored by the rights-score procedure, the person who adopts a strategy of getting as many right as possible, even at the cost of a few errors, has the advantage (p. 121).

Since data from the present study include Rights, Wrongs, and other scores on the D-48 and the CMT, it would be possible to investigate some of the implications of Horn and Bramble's observation to discover differences in personality characteristics associated with these two strategies of test-taking. Moreover, such further study of the present subjects in this regard would also relate to the observation made earlier that some of the subjects may have found the CMT Vocabulary too difficult. Such a subject may have employed a different strategy on the Analogies and the D-48 than he did on Vocabulary. The finding in the present study concerning the relation of verbal interests to intelligence test scores may also be of importance here.

No matter how "bright" a young student is, he cannot do well on a vocabulary test unless he has the requisite knowledge of words and their meaning. However, on deductive tests like the D-48, that may be more basically described as a function of "g" and that do not require specific kinds of knowledge or information in order to arrive at a correct answer, the student would not be at any disadvantage. There may be, then, a confounding effect of knowledge and test-taking strategy in the CMT Vocabulary which might be elucidated by systematic analyses of the scores for the present subjects.

A number of recommendations, some specific and some general, are made on the basis of the results from the present study and in the context of the particular analyses carried out in it.

1. The D-48 should be added to the test armamentarium of the school psychologist. It seems to have inherent appeal to subjects, is easily administered and scored, and is suitable for a wide range of age and of intellectual ability.

2. The present study confirms the misplacement in terms of difficulty level of many of the D-48 items. The test publisher should be urged to revise the test booklet so that the serial order of items follows the difficulty level found in this study and that reported with other groups of subjects. Since the D-48 is a timed test, it is particularly important that the items be arranged in order of difficulty.

3. The CMT may be recommended for use with superior high school students although it may not be suitable for the average adolescent in its present form. Information given in the present report would be of value in selecting items that are not too difficult for the average student and might form the basis of a revision or an abridgement of this test.

4. When the CMT is used with adolescents or adults, the part scores on Vocabulary and on Analogies should be reported as well as the total score. Further studies are needed to verify the present finding of greater correlation between Vocabulary and verbal interest than with Analogies. The similarity between the D-48 and Analogies should also be replicated with other types of subjects.

5. Neither of the intelligence tests seem to be grossly affected by anxiety or impulsiveness as measured by MMPI scales for the present subjects. The D-48 and the CMT could be used for screening and selection purposes without fear that intellectual performance would be seriously underestimated because of these two personality characteristics. It is recommended that the remaining scales of the MMPI and of the Adjective Check List be correlated on an exploratory basis for the present subjects to determine the influence that other personality characteristics may have.

6. Since two vocational interest scales showed significant correlations with the CMT, although not with the D-48, it would help clarify the relationship of interest and intelligence to correlate all of the remaining Strong VIB scales with the two intelligence tests for the present subjects. Results from a correlational analysis might suggest additional subgroups for detailed study.

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800 ABSTRACT

801 Subjects: 1163 gifted adolescents in a special summer program.
802
803 Measures: intelligence--D-48 (timed, non-verbal), Terman Concept Mastery
804 (untimed, verbal): anxiety--MMPI A scale; impulsivity--MMPI Pd
805 and Ma scales; verbal interest--Strong VIB Lawyer and Author-
806 Journalist scales; carelessness--errors on "easy" intelligence
807 items.
808
809 Results: significant correlations--anxiety and intelligence, negative;
810 impulsivity and intelligence, negative; verbal interest and
811 verbal intelligence, positive; non-verbal and verbal intelli-
812 gence, positive; carelessness and intelligence, negative.
813
814 Additional findings: Adjective Check List Counseling Readiness positively
815 correlated with intelligence. D-48 more similar to
816 Concept Mastery analogies than to vocabulary.

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